

CAREERS

GRANT BOOST Women's funding success rates soar after bootcamps **p.121**

FAST TRACK Australian PhD programme opens industry doors **p.121**

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ACADEMIC EXCELLENCE

Golden Germany

Government's push for excellence is creating a golden age of opportunity for scientists flocking to the country.

BY QUIRIN SCHIERMEIER

Berlin inspires. Less dominated by international finance and commerce than many other global cities, the vibrant German capital is a cultural laboratory that exerts a special fascination for hipsters, hedonists and holidaymakers. But Berlin's invigorating intellectual biosphere also attracts creative minds and scientists from around the world. John Dunlop, a group leader at the Max Planck

Institute of Colloids and Interfaces in Potsdam, near Berlin, is one such researcher. The Australian biophysicist investigates parallels between living matter and synthetic structures — and he loves Berlin's special flair.

"The atmosphere here reminds me of the Bauhaus approach to design and architecture a century ago," he says. "There is a lot of freedom to try new things without too much pressure to think about commercial exploitability."

Dunlop participates in an interdisciplinary

laboratory, ambiguously called Image Knowledge *Gestaltung* (roughly translated as 'design'), that is funded by the German federal government as part of its Excellence Initiative. The collaboration — one of 43 'excellence clusters' across Germany — involves a mix of natural scientists, designers, cultural historians, media theorists and linguists from several universities and research institutes in the Berlin-Brandenburg region. The idea is to identify principles that control how the design of material structures, ranging from office buildings to the shells of bizarre marine creatures, in turn control their inhabitants' operation and communication. This is interdisciplinary research with uncertain outcomes — but the results could be used at some point in robotics, teaching or health care.

"Germany is a really good place for such ventures," says Dunlop, who did a PhD in France before he came to Potsdam in 2005 as a postdoc. "I can think of no other way of getting funding for a project where I could work together with so many people outside my own field."

The €4.6-billion (US\$5.4-billion) Excellence Initiative, launched in 2005, has helped to attract at least 4,000 foreign scientists to Germany (see page 18). And more foreign talent is likely to arrive as the programme, which includes funding opportunities for numerous PhD students, postdocs and young group leaders, enters its next round in 2018. (All major political parties participating in the upcoming federal elections on 24 September have said that they want to continue the programme.)

The initiative has revolutionized Germany's academic landscape. It nullified a long-held paradigm that the country's more than 100 research universities (fewer than half of which are now involved in the excellence framework) are all equal in quality. The initiative, a competition for top-up funds from the government, aims to make German universities more competitive internationally. Its second round in 2012 produced 11 'elite' universities that each get an extra €12.5 million per year for their campus-wide institutional-improvement strategies. A further 28 universities received extra money for setting up promising excellence clusters — research hubs that bring together different groups within the university or the wider region — and international graduate schools.

According to preliminary analysis by the DFG, Germany's main funding agency, universities involved in the programme have measurably improved their research output in key fields such as physics and chemistry.

A 2015 analysis by *Nature* found that ▶

► Germany's 14 top universities — the 'elite' of the Excellence Initiative — produced 35% of the country's total scientific output, up from 29% in 2002 (*Nature* 525, 168–169; 2015). And of all articles published by German authors, one-quarter are now ranked in the top 10% worldwide by citation, compared to one-sixth 15 years ago. Some lesser-known research universities involved in the Excellence Initiative were rivalling the country's top institutions in their rate of improvement.

And an international evaluation panel convened by the German government found last year that the excellence clusters are among the initiative's most tangible successes. The clusters, which each received up to €8 million per year in the 2012–17 programme period, should be the focus of future funding rounds, the panel recommended.

The government had decided in 2015 to continue the Excellence Initiative (now known as the Excellence Strategy) beyond 2017, dispelling fears that its gains might be unsustainable. From 2019 onwards, about €385 million per year will be available for 45–50 yet-to-be-selected clusters. By April, 63 universities had submitted 195 draft proposals (including those from all existing clusters), which are now under review. A shortlist will be announced on 28 September, and those selected will be invited to submit full proposals.

FOLLOW THE MONEY

Although the largest research universities, such as those in Munich and Heidelberg, have not climbed to top positions in international academic rankings, Germany as a whole is a big player in international science. Thanks to the government's strategic science policies — more than a decade of steadily rising public research budgets have created exceptionally good funding opportunities — it has gained in attractiveness to foreign researchers (see 'International flair'), including many from strong science nations such as Australia, Canada and the United Kingdom.

Kylie Luska, for example, had not planned to spend more than a couple of years in Germany when he took up a postdoc position at the RWTH Aachen University in 2012. The Canadian chemist specializes in processes involved in converting biomass into efficient biofuels. His supervisor at the University of Guelph in Canada told him about Germany's particular strength in chemistry and the country's ambitious green-energy goals. Aachen's excellence cluster for tailor-made fuel from biomass proved a perfect match for his own interests, he says. "Gathering experience in a country at the forefront of the global energy transition seemed a perfect opportunity to advance my career in green chemistry," Luska says.

His work on nanoparticles that convert biomass substrates into fuels earned him a group-leader position after four years, funded mostly

RESIDENCE GUIDE

Settle in Deutschland

Here are some tips for navigating Germany for junior researchers from abroad.

Housing: The relatively high cost of living in Germany is comparable to those in the Netherlands, Italy or France. But flat-rental prices vary greatly. In large cities such as Munich, Frankfurt and Düsseldorf, rents are higher than in smaller university towns. In Berlin, despite the city's popularity, rental prices are comparatively modest.

Taxes: All foreign researchers in Germany with a regular contract of employment must pay normal taxes and contributions to social insurance, including those for mandatory

health coverage. Holders of research scholarships are usually exempt from taxation, but need to prove health insurance. Scholarship providers can provide relevant information.

Visas: For European Union citizens, there are no visa requirements in Germany. Citizens of all other countries need visas for extended stays. Researchers can apply for a 'scientific visa', which they will receive along with a residence document.

Language: Basic knowledge of German is recommended. The Goethe Institute offers German classes in more than 90 nations. **U.S.**

by the Aachen excellence cluster. Employed on a fixed-term contract, he is not sure how his future will unfold. But he hopes that his stint in Aachen, where scientists and engineers are working to reconcile fundamental chemistry with technical aspects of combustion engines, will improve his prospects of finding a permanent position in Germany, Canada or elsewhere.

The future is also open for Rebecca Scott, an ecologist at the GEOMAR Hemholtz Centre for Ocean Research Kiel. In 2013, before she finished her PhD at Swansea University, UK, she won a €225,000, three-year grant from the 'Future Ocean' excellence cluster in Kiel for her research on the juvenile life stages of sea turtles. A follow-up €150,000 package allowed her to extend her postdoctoral stint at GEOMAR. Recently, she secured another €200,000 to add a further two years. With the centre's engineering department, she developed floating mock

turtles and tiny acoustic tags, which stick to hatchlings' undersides. The team uses these to track the elusive drifting patterns of baby turtles in the ocean currents off Gabon in West Africa.

Involvement in the cluster gives her ample freedom for her expensive fieldwork and a level of funding security unusual at her early career stage. "It's a great advantage that I have face-to-face contact in Kiel with senior people on grant-review committees," she says. "These people understand my work and give me all the support I need."

For personal reasons, she still wanted to return to the United Kingdom — until the Brexit referendum last year, in which the nation voted to leave the European Union, prompted her to extend her stay in Germany for at least a couple more years. One reason, she says, is that a starting grant from the prestigious European Research Council (ERC), for which she plans to apply in the near future, might require her to be affiliated with a host institute in an EU country. "For now, Germany is a much safer place to do science than the UK, where nobody really has a clue what is going to happen," she says.

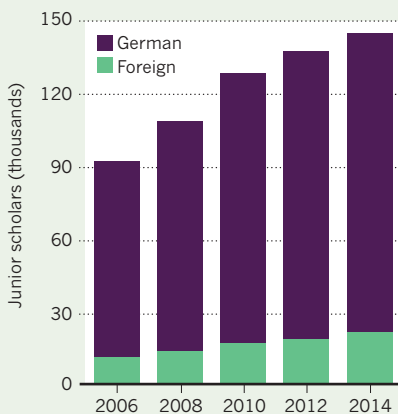
ROOM FOR IMPROVEMENT

The DFG last year allocated a record €2.9 billion — not including extra money from the Excellence Initiative — to individual researchers and 298 collaborative research centres (*Sonderforschungsbereichen*). The success rate for individual grant proposals to the DFG — 36.5% on average between 2013 and 2016 — is higher than the US or UK rates. Even so, increasing dependence on grant money is a concern for many young scientists

So is the lack of permanent positions in academia. Almost 30,000 doctoral titles are awarded in Germany every year, and the number is rising. A federal law (*Wissenschaftszeitvertragsgesetz*) limits the time that scientists can be employed on fixed-term contracts to

INTERNATIONAL FLAIR

The number of young foreign scientists in Germany more than doubled since 2006. In 2014, some 21,500 foreign junior scholars accounted for 15% of all early-career researchers employed by German universities.





Ecologist Rebecca Scott tags turtles in Gabon.

12 years. The federal science ministry promotes the introduction of US-style tenure-track programmes that would give young scientists more career security. A government-funded €1-billion programme launched this year aims to create 1,000 tenure-track positions over the next 15 years. But currently, these positions are still rare.

Ziad Hafed, a neuroscientist previously at the Salk Institute for Biological Sciences in La Jolla, California, was reluctant to accept a financially and scientifically attractive junior group leader position he was offered in 2009 by the Centre for Integrative Neuroscience in Tübingen, another excellence cluster. But the centre eventually agreed that he would be promoted to a faculty position after a successful evaluation of his group's progress. He passed that hurdle in 2015, and is now determined to stay in Germany.

Hafed, a citizen of Egypt and Canada who grew up in Bahrain, studies how the brain handles visual perception. "I had never really thought about going to Europe," he says. "And I wouldn't be here if it wasn't for the Excellence Initiative."

Before he took up his job in Germany, Hafed had convinced himself that research conditions in Tübingen, a hotspot for brain research at all fronts, would leave nothing to be desired. But issues cropped up. One is the "shocking" amount of paperwork associated with animal experiments, he says. Another is the level of public hostility to animal testing that in 2015 caused one prominent scientist in Tübingen to throw in the towel.

In Germany, says Hafed, brain researchers need to take a proactive approach to explaining their science to the wider public. "I'm fairly happy as long as we're able to do our experiments," he says. "But I do realize that we must work hard to demonstrate that what we're doing is beneficial and justified."

Germany was not at the top of Xiaoxiang

Zhu's list in 2005 when she — then an undergraduate student in her native China — decided that it was time to gather international experience. But when she learnt from a Chinese cartographer in Germany that the Technical University of Munich (TUM) had launched an international master's course for Earth-oriented space science and technology, she opted for the Bavarian capital.

It was a good decision, she says. Dividing her time between the TUM and the German Aerospace Agency (DLR), Zhu is now an assistant professor in a rare tenure-track position. At a DLR centre outside Munich, she has access to global Earth-observation data sets, including high-quality data from a pair of German radar satellites. Her idea of using satellite imagery to make 3D maps of the world's major cities — and using social-media content to determine the function of urban infrastructures — secured her a €1.5-million ERC starting grant last year and made her a poster child for the TUM's efforts to attract foreign talent.

Foreign scientists are usually not expected to teach courses in German. Many, such as Zhu, are able to negotiate a light teaching load. But German-language skills and a certain instinct for cultural idiosyncrasies — deciding whom to address formally, and whom to offer the informal 'Du', requires some sensitivity, for example — are advantageous when dealing with university administrations, tax offices and in everyday life (see 'Settle in Deutschland').

"Language is not a barrier in the lab — but it helps to speak German when you are dealing with local ethics or regulatory authorities over research permits and the like," says Pierre-Yves Lozach, a French-born virologist with CellNetworks, an excellence cluster of

"I wouldn't be here if it wasn't for the Excellence Initiative."

cell-biology institutes in Heidelberg. Lozach took a career risk in 2013 when he quit his tenure-track position at the INRS-Institute Armand-Frappier in Laval, Canada, for a fixed-term group leader job at the University of Heidelberg, which had offered dual-career positions to him and his wife. Any newcomer to the country should take pains to learn German, he says, adding with a chuckle that he was a bit idle himself in that regard.

But language aside, Lozach sees no roadblocks to doing competitive science in Germany. "If I don't make it here, it will be my own fault," he says. Heidelberg, home also to the European Molecular Biology Laboratory and the German Cancer Research Center, is an unfailing source of talent and ideas. "If I can secure a permanent science job in the region," he says, "I'm quite determined to stay." ■

Quirin Schiermeier is Nature's Germany correspondent in Berlin.

GRANT SUPPORT

Workshops for women

Female researchers in the United States who participate in grant-writing 'bootcamp' workshops report greater subsequent funding success, according to a study published in June (J. L. Smith *et al. BioScience* 67, 638–645; 2017). Participants attended one of three 6-week bootcamps over an 18-month period in the past 5 years at Montana State University in Bozeman. A year later, they had submitted a significantly higher number of grants than those who did not attend a bootcamp. They had also won more grants, increased the number of proposals on which they were principal investigator and raised their overall funding. The authors attribute the outcomes to the high quality of the proposals submitted after training, rather than only to an increase in the number of submissions. The bootcamp was designed to support female researchers' feelings of autonomy, competence and connection. The authors say that dissatisfaction with research support is a major reason that women leave university research careers, and suggest that grant-writing bootcamps might help to retain and advance female academic researchers.

PHD TRAINING

Fast track to industry

Australia is introducing a pilot industry-PhD programme, dubbed iPhD, to encourage innovative research in energy and engineering. The programme is a joint venture between the Commonwealth Scientific and Industrial Research Organisation, the University of New South Wales in Sydney and industry partners in computer science, electrical engineering, materials engineering and energy. Successful candidates will receive a scholarship of Aus\$40,000 (US\$31,700) per year for 4 years to conduct an industry-focused project and a 6-month internship at a partner company. iPhD students will receive instruction in intellectual property and commercial-product development; start-up business practices; project management; and team-building and interpersonal skills. Participants will be matched with an industry mentor and two research supervisors on the basis of their chosen research area. The programme is expected to expand to include more universities and all disciplines in science, technology, engineering and mathematics. Applications close on 15 September (see go.nature.com/2xvs4ws). The first iPhD candidates will start in 2018.